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About Our CONTRIBUTORS

EMANUEL RATHSMILL, D.D.S. is a graduate of Temple University, the class of 1921 and his co-author, JOSEPH HAROLD SHOR, D.D.S., of the Chicago College of Dental Surgery (June, 1942) is in the Naval Reserve, awaiting his call to duty. Both authors are in general practice.

JACOB A. SAFFIR, D.D.S. (University of Illinois, College of Dentistry, 1923) has been a contributor to the literature, has had patents assigned to many of his inventions, and is at present interested in plastics research and in the etiology of dental caries.

JAMES ARTHUR MALCOLM, D.D.S. was graduated from the University of Pittsburgh, class of 1923. Doctor Malcolm has given numerous clinics and courses on the subject of occlusal rests and his present article in this magazine was planned as a clinic on paper.

GREGORY B. SALISBURY, D.D.S. (Temple University, 1934) is the author of a series of articles which appeared in these pages in January, February, and March of this year. This month Doctor Salisbury suggests some improvements in his technique at the same time that Doctor Saffir takes exception to many of Doctor Salisbury's contentions. Interest is alive in the subject of the methyl methacrylates. Because techniques are still developing and the use of the material is experimental, this magazine feels it is healthy to offer opposing points of view by serious investigators.

A. H. TAMARIN, D.D.S. (Chicago College of Dental Surgery, 1917) is in general practice and teaches art at the Park Ridge School for Girls.

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Indirect Inlay Technique Using an Alginate Impression Material

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DIGEST

Satisfactory powdered elastic impression materials are on the market to take the place of hydrocolloids which are now scarce. The new elastic impression powders have as their basic constituent a soluble salt of alginic acid. By chemical reaction of its materials an insoluble and elastic calcium alginate is formed.

A method for gingival retraction in cavity preparation is suggested.

The armamentarium includes a syringe from which the impression material may be extruded directly into the cavity to prevent trapping of air. How to make this syringe from materials in the office is described.

The procedure follows through from the actual impression technique, the treatment of the impression in a fixing solution, the preparation of the working model, to completion of the inlay.

THE AMERICAN dental profession was introduced to the new powdered elastic impression materials as a direct result of Pearl Harbor, and the cutting off of our supply of oriental agar. More than a year and a half has elapsed since then, and now several brands of the impression powders are selling at dental depots throughout the country, and the material is in everyday use in thousands of offices and in many schools and clinics.

Experience and time have shown that not only are these materials satisfactory substitutes for hydrocolloids but that they surpass them in many qualities, including accuracy, ease of manipulation, comfort for the patient, and cheapness per unit.

Composition of Elastic Impression Powders

The basic constituent of all elastic impression powders is a soluble salt of alginic acid—a product obtained from kelp, which is procured from native seaweeds.[1] Sodium, potassium, or ammonium alginate is used. Anhydrous calcium sulphate, trisodium phosphate, various fillers, harmless dyes and flavoring agents make up the remainder of the mixture.

When water is added to the powder a heavy, creamy mass results which sets,

[1]Dickson, George and Schoonover, I. C.: Preparation and Characteristics of Elastic Dental Impression Compounds with an Alginate Base, J. A. D. A. 30:565 (April 1) 1943.

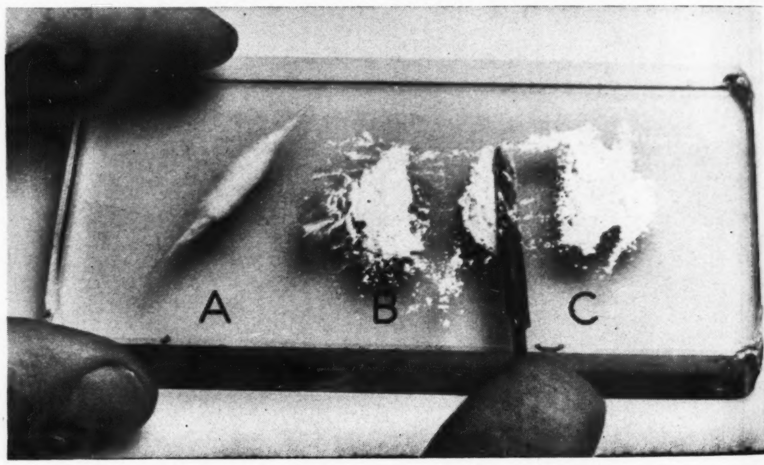

Fig. 1—A, Fusiform cotton pledget; B, zinc oxide-eugenol mix; C, zinc oxide.

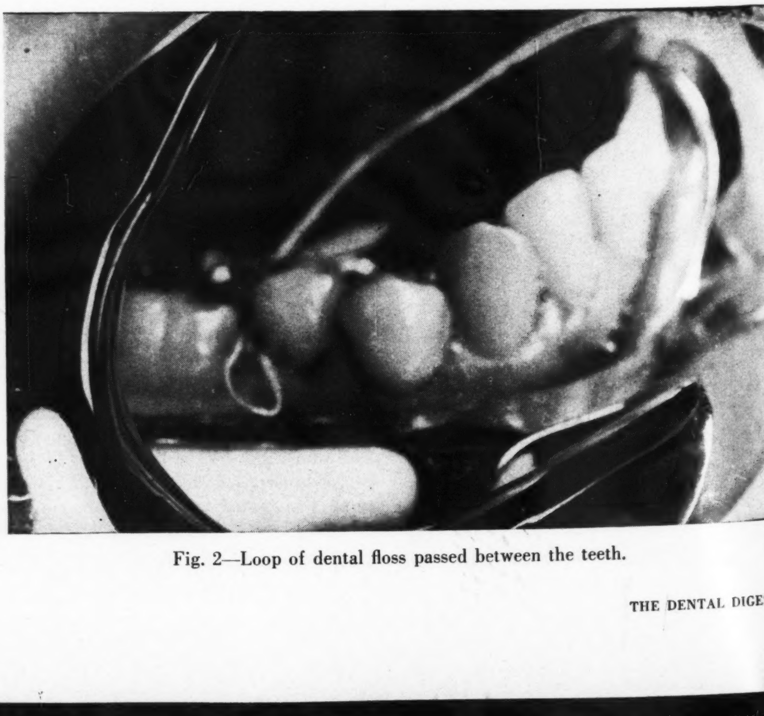

Fig. 2—Loop of dental floss passed between the teeth.

after a given length of time, to an insoluble elastic gel. This setting is due to the chemical reaction of the materials contained in the powder. Slightly soluble calcium sulphate when added to water releases calcium ions slowly. These react first with the trisodium phosphate to form an insoluble phosphate. After all phosphate ions have been used, the remaining calcium ions unite with the soluble alginate to form insoluble and elastic calcium alginate. The trisodium phosphate reacts before the alginate as it forms the least soluble salt. The phosphate may thus be considered a buffer, and its addition or withdrawal from the mixture directly controls the setting time.

Although mainly intended for use in partial denture construction, their inherent qualities of accuracy of surface detail and facility of manipulation instantly recommend the use of elastic impression powders for constructing inlays by the indirect method.

A Method for Gingival Retraction

Alginate impression powders, like the hydrocolloids, lack the body necessary to displace the free gingiva so that an accurate reproduction of the gingival seat may be included in the impression. To overcome this difficulty a method had to be devised to retract this free gingiva temporarily and expose the entire gingival margin of the cavity preparation. For this purpose, an orthodontia rubber band may be slipped around the tooth under preparation, as advocated by Lieutenant R. H. Stearns, D.C., USNR.[2]

A less risky and thoroughly satisfactory method for gingival retraction (Figs. 1, 2, 3, and 4) is as follows:

1. After diagnosis for an inlay restoration has been made, and before cavity preparation has been started, the tooth is isolated with cotton rolls and dried.

2. A fusiform pledget of cotton is formed and placed on a cement slab. On this slab a heavy mix of zinc oxide and eugenol, or wondrpak powder and liquid, is made and thoroughly incorporated into the spindle-shaped cotton pledget (Fig. 1).

Fig. 3—Cotton pledget snared in loop and pulled through interproximal space.

3. A loop of dental floss is passed through the contact point of the carious side of the tooth (Fig. 2).

4. One of the pointed ends of the cotton pledget saturated with the zinc oxide-eugenol mix is trapped in this loop and by drawing the floss back through the interproximal space, the cotton pledget is pulled through with it (Fig. 3).

5. Grasping the protruding point of the cotton spindle with cotton pliers the pledget may be so adjusted that the bulkiest portion is just below the contact point. Blanching of the gingival tissue in the area will indicate that the free gingiva is sufficiently retracted. The ends of the pledget are snipped off, and with a plastic instrument the pack is contoured for the patient's comfort (Fig. 4).

This pack may be left in place for an indefinite period with no untoward results, as the retraction of the gingival tissue is not progressive. (This is a definite advantage over the rubber band method). At the next appointment the pledget may be removed and the cavity prepared for an inlay in the customary manner.

If it is necessary to complete the cavity preparation at the first appointment, a spindle-shaped cotton pledget of maximum bulk may be made, lubricated with vaseline, and forcibly pulled through the interproximal space until it rests just below the contact point. It should be left in place during preparation of the occlusal lock of the cavity. After this short lapse of time the pack may be withdrawn. Usually the free gingiva

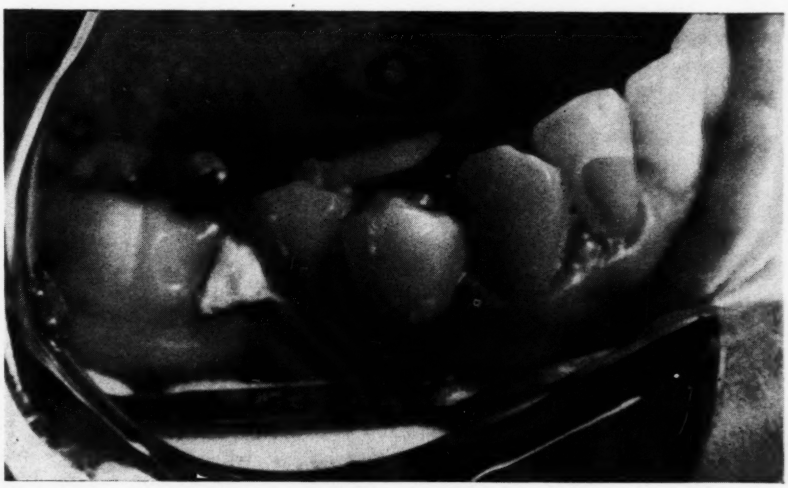

Fig. 4—Pack completed.

[2]Stearns, R. H.: Hydrocolloid Impressions for Operative Dentistry, DENTAL DIGEST, 49:158 (April) 1943.

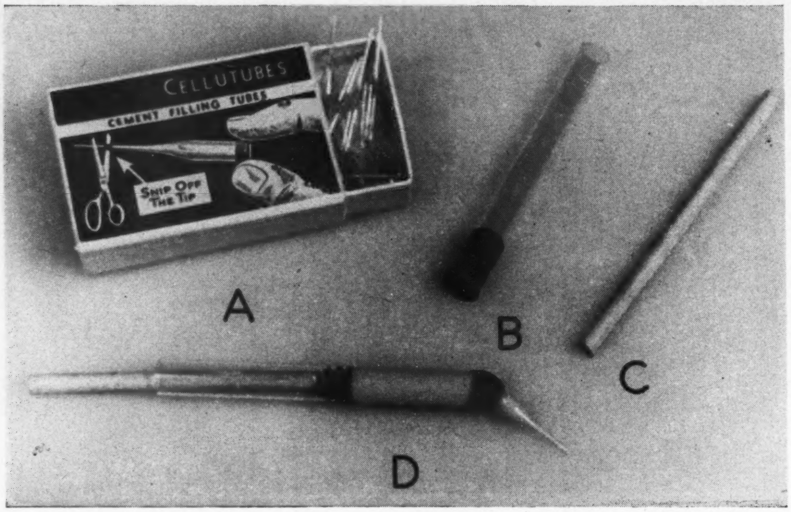

Fig. 5—Parts used to make up the syringe: A, cellutubes for needle; B, used anesthetic tube for barrel; C, orangewood stick for plunger; D, assembled syringe filled with alginate elastic impression compound.

their anesthetic solution in tubes with constricted tips but it is not necessary to change anesthetic brands in order to employ this alginate impression technique, as the ends of regular tubes may be quickly constricted by fusing the glass while rotating the tube in the laboratory Bunsen flame.

The cellutube is mounted on the constricted end of the anesthetic tube with sticky wax reinforced with cotton fibers. The pointed end of the cellutube should be snipped off at such a level that its diameter is large enough to fit into the smallest recess of the cavity. (The construction of this syringe may sound rather complicated, but in reality, the assistant can make up a dozen in half an hour's time.)

An ordinary crown and bridge tray is

will remain displaced for the time necessary to complete the cavity preparation and take an accurate impression.

Armamentarium

Unfortunately the alginate mixture cannot be placed in a tray and carried to place in the mouth with hope for a successful impression. Air will be trapped in the cavity, causing voids in the most essential areas of the impression. The material must be extruded from some kind of syringe directly into the cavity itself, thereby eliminating completely the chance of enclosing air bubbles within the impression. To this end we have constructed, from materials at hand in nearly every dental office, a syringe thoroughly adapted to this purpose. The parts that go to make up this simple apparatus are shown in Fig. 5.

A Caulk cellutube forms the "needle" of the syringe and is its most costly member. The barrel of the syringe is formed by a used local anesthetic tube, its rubber stopper forming the "piston." A short length of an orangewood stick makes a handy plunger.

The rubber stopper and cap are first removed from the empty tube and the stopper is retained to serve as the piston. The cellutube must now be attached to the end of the empty anesthetic tube. This end is usually considerably wider than the lumen of the cellutube, and for convenience of mounting, it must be constricted. Some manufacturers supply

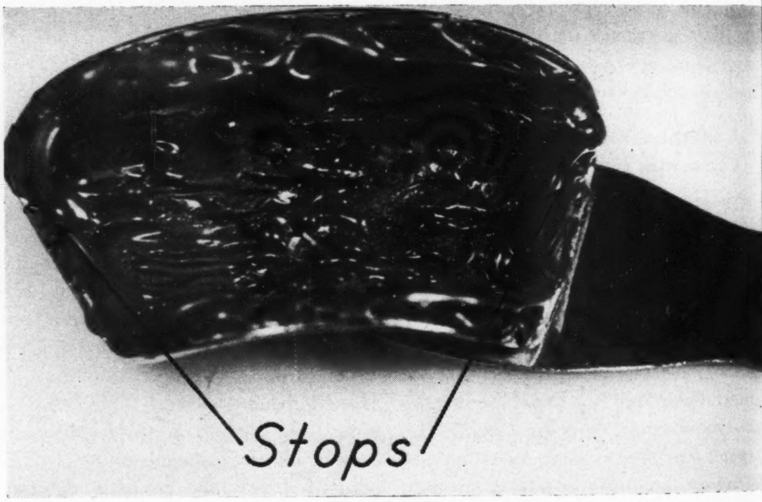

Fig. 6—Specially prepared tray.

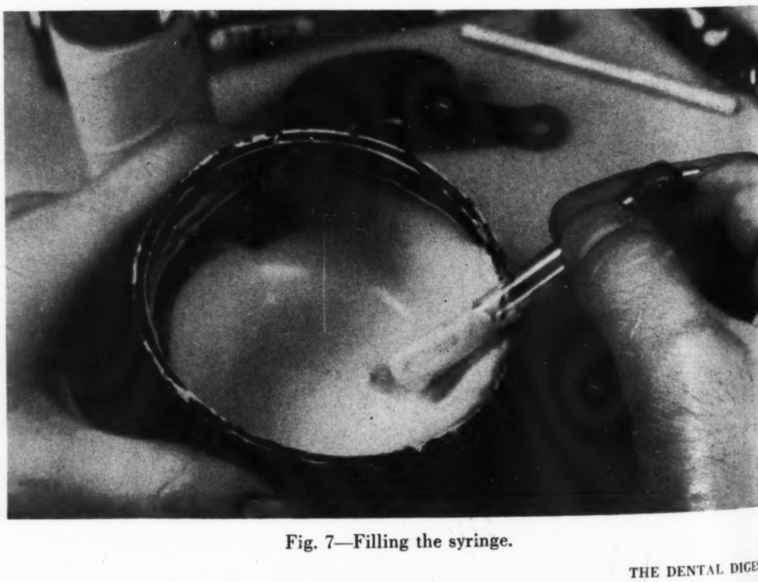

Fig. 7—Filling the syringe.

lined with modeling compound which is heavily scored with a hot spatula to provide for the retention of the elastic material within the tray (Fig. 6). Ridges of modeling compound are formed at both ends of the tray to act as stops when the tray is placed in the mouth. This completes the armamentarium.

Impression Powders

There are many excellent alginate impression powders available on the market, including: Caulk's Zelex; Coe-loid; D-P Elastic Impression Cream. All these products work well, although we have been using Coe-loid. Through experience we have found that only one third of the powder required for a full mouth impression is necessary in this technique.

The average Coe-loid unit contains 13.8 Gm. of powder. One third of this amount is approximately 4.5 Gm. A number of tubes may be so divided and this one-third by weight portion *well sealed* in small envelopes for future use. All that is required for mixing with this abbreviated unit is 18 cc. of tap water.

Impression Technique

1. The cavity and adjacent teeth should be isolated with cotton rolls and dried.

2. The proper amount of impression powder should be placed in a clean dry mixing bowl and 18 cc. of water between 65° F. and 75° F. are added to it. The material is briskly spatulated from 1 to 1½ minutes, when a smooth, creamy, lump-free mix will be had.

3. The syringe may now be filled with short, sharp thrusts into the mix (Fig. 7). (It is not necessary to fill the tube completely: one-fourth tubeful is sufficient for any size cavity.) The stopper is then slipped into the tube and the outside of the syringe wiped clean of excess material.

4. The specially prepared tray should be filled with the remainder of the mix and placed in readiness on the bracket table.

5. The plunger should be placed in the syringe and pressure applied until all air is forced out of the tube and the impression compound has reached the tip of the cellutube.

6. The tip of the needle is placed well

Fig. 8—Ejecting elastic compound into the cavity preparation.

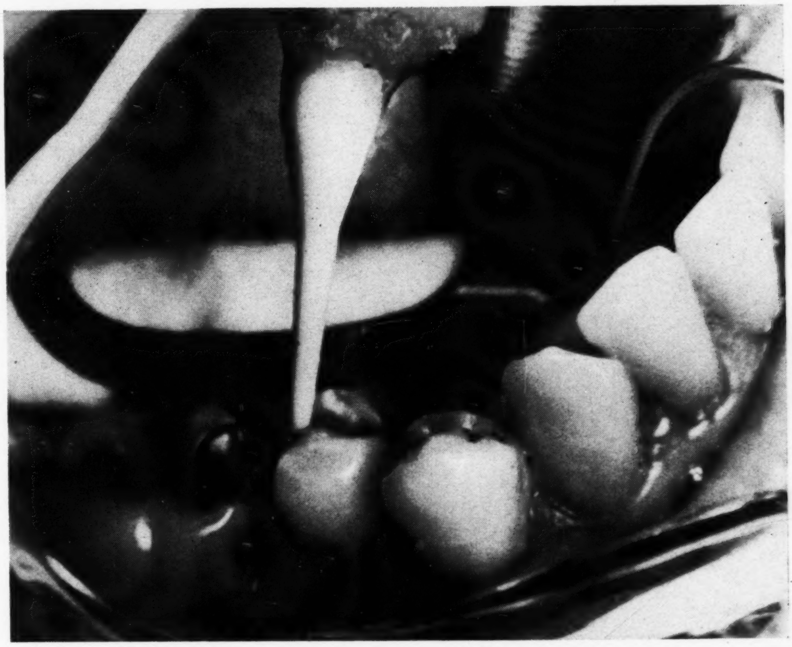

Fig. 9—Position of needle of syringe in cavity.

Fig. 10—Covering all margins of cavity preparation with impression material.

Fig. 11—Placing the tray.

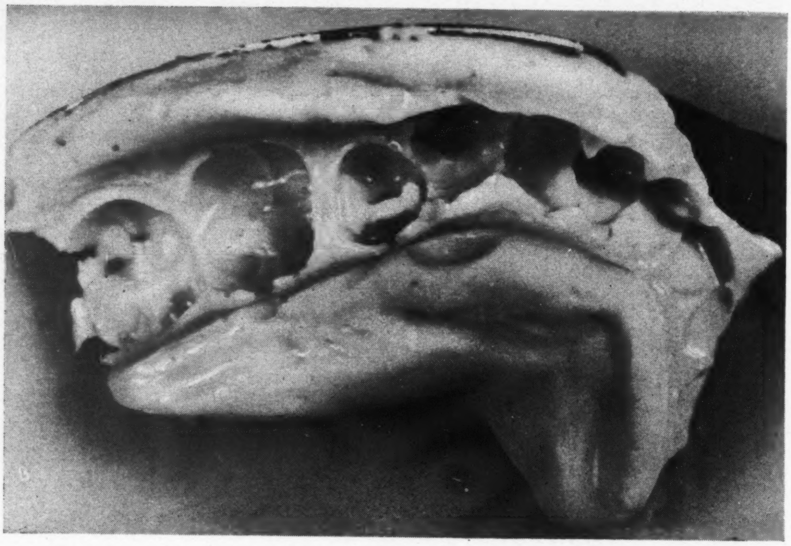

Fig. 12—The impression.

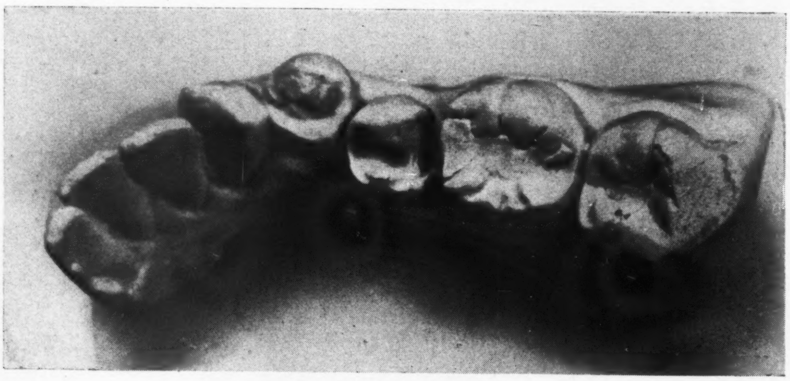

Fig. 13—The stone model.

into the proximal portion of the cavity, and the impression material rapidly extruded. The syringe is guided into the occlusal lock of the cavity, ejecting being done throughout all its movements. (The syringe must not be moved without material being ejected as air bubbles will be drawn into the cavity.) The operator should continue the ejection until the elastic compound has filled the cavity preparation and completely covers the tooth (Figs. 8, 9, and 10).

7. The bridge tray, filled with the remaining material, is then firmly brought to place over the prepared tooth. The modeling compound stops at each end of the tray assure the operator of obtaining an even thickness of elastic impression material all around the teeth (Fig. 11).

8. With water at 70° F., three minutes are usually sufficient to effect a final set. The tray should then be removed from the mouth with a sharp pull in the line of the long axis of the teeth. The impression must be thoroughly rinsed in cold running water for three minutes (Fig. 12).

9. During this interval, a wax bite may be taken by placing a softened button of inlay wax into the cavity preparation and having the patient bite into it. In this way a good working guide of the patient's occlusion is obtained. At this point the cavity may be temporarily filled in the usual manner and the patient dismissed.

Treatment of the Impression

After it has been rinsed in running water for three minutes, the impression should be immersed in a fixing solution for ten or fifteen minutes. This fixing solution may be made by dissolving 10 Gm. of either potassium sulphate or manganese sulphate in each 100 cc. of water. (Fixing wafers are supplied with Coe-loid to make up the fixing solution.) This solution aids in cleansing and preserving the impression and is of definite value in obtaining a smooth hard stone model. The impression should be left in the fixing solution until the model is to be poured. Our experience has shown that Coe-loid impressions may be left in the fixing solution up to seventy-two hours with no measurable distortion or loss of accuracy. The impression in Fig. 12, from which the inlay shown in Fig. 16 was made, remained in the fixing solution for three days before it was poured. As can probably be seen from the photograph, the restoration is satisfactory. (This fixing solution should not be discarded as it may be used again.)

If these suggestions conflict in any way with the directions accompanying the particular brand of alginate powder used, follow the manufacturer's advice as to the treatment of the impression.

When the model is to be poured, the fixing solution should be rinsed out of the impression with running water and the surface of the impression freed of water film with a gentle stream of air. Artificial stone is mixed and vibrated into the impression (Fig. 13).

Preparation of a Working Model

1. To prepare a convenient working model from the stone model just poured the operator must first heavily score the underside of the stone cast.

2. This scored base is then lubricated with vaseline and placed into a small mass of freshly mixed artificial stone. When completely hard, the model is removed from what will soon form the matrix of the working model (Fig. 14, B).

3. The original stone die is sawed into as many pieces as necessary to have good access to all margins of the cavity. In the illustrated case one saw-cut was all that was needed. The operator should not cut completely through with the saw blade. It is best to stop a millimeter or so before completely sawing through and then break the model apart with hand pressure. In this way the saw blade will not harm the gingival margin of the model. Fig. 14 shows the disarticulated model (A), the stone matrix (B), and the wax bite, registering occlusion (C). This dismembered model and its matrix form the working model.

Completing the Inlay

The model must first be well lubricated with a good die lubricant and then the wax bite may be slipped in place and trimmed to contour. The margins and deep recesses of the cavity should be accurately corrected in the wax, a hot plastic instrument being used for this purpose. The contact point of the pattern may be formed with a high degree of accuracy by reassembling the disarticulated model in the matrix and making any adjustments that prove necessary (Fig. 15). The finished wax pattern may then be invested and cast by any favorite technique. The casting can be adapted carefully on the stone model and even preliminary polishing can be accomplished; however, the final adaptation and burnishing of margins is best done in the patient's mouth. After polishing, the inlay should be cemented in place (Fig. 16).

4941 *Monument Road.*

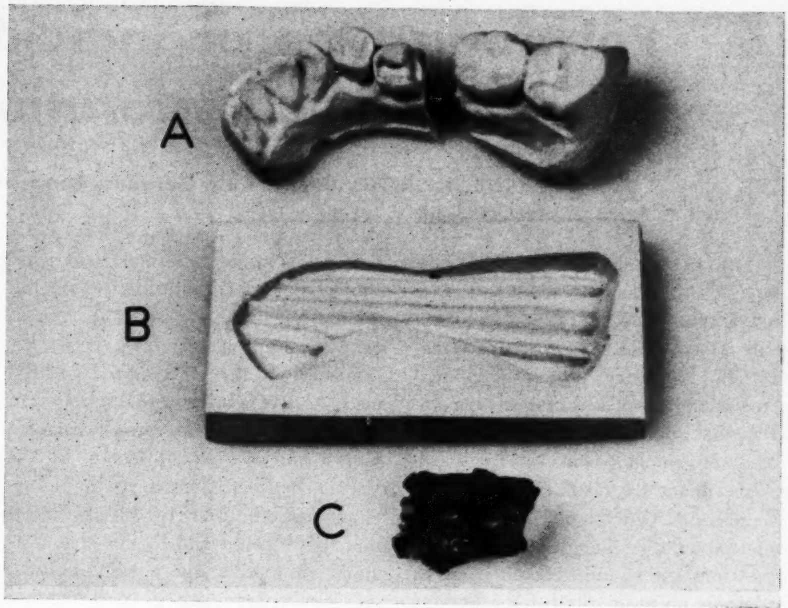

Fig. 14—A, Dismembered model; B, Stone matrix; C, wax bite.

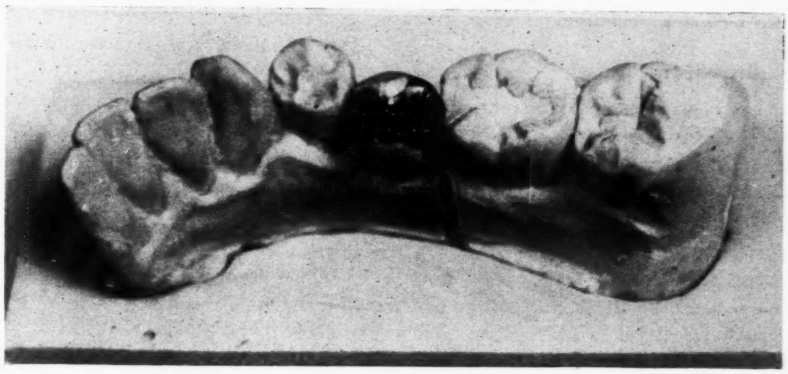

Fig. 15—Completed wax pattern in model in place in matrix.

Fig. 16—Completed inlay after cementation.

Polymerization of Individual Direct Acrylic Restorations

JACOB A. SAFFIR, D.D.S., Kew Gardens, Long Island, New York

IN THE LAST February issue of THE DENTAL DIGEST, appeared an article on POLYMERIZATION OF INDIVIDUAL DIRECT ACRYLIC RESTORATIONS by Gregory B. Salisbury which attributed some remarkable advantages to methyl methacrylate. Most of these attributes were included in several paragraphs under the heading "Refutation of Published Objections," and the bibliography shows that these "published objections" were mine, taken from an article on an evaluation of acrylics for masticatory surfaces, in the December, 1942 issue of the *Journal of the American Dental Association.*

Brinell Hardness

In discussing some of the refutations, reference is had to page 61 of Doctor Salisbury's DIGEST article, from which the following is quoted verbatim:

"Actually the Brinell hardness of acrylic restorations is not 18-20 as given by the chemistry books. It is about 30, because of the use of fillers and opacifiers." It is to be regretted that this author, in his mistrust of the chemistry books, does not look at the *Plastics Catalog* for 1942 or 1943, upon which my figures were based. Here, the authority is Doctor Gordon M. Kline, the editor, Chief of the Organic Division of the Bureau of Standards for approximately fifteen years, who is considered one of the greatest experts in plastics in the world today. In a letter[1] to me, Doctor Kline states that these figures published in the table came from the DuPont Company and Rohm and Haas, the manufacturers of methyl methacrylate, from which sources, Doctor Salisbury indicates that he receives his material. The accompanying Table 1 shows the physical properties of the pure material. In that form, the physical properties would be better than what could be obtained with the use of "fillers and plasticizers." From investigators here and in England, we receive the information that plasticized methyl methacrylate is inferior to unplasticized in most physical properties. This fact is known and is even attested to by the Vernon-Benshoff Company who publicly announce in their April *Work Bench* that they "could add to this that it is more absorptive, more soluble, with increased possibility of post-molding change."

Masticatory Stresses

Doctor Salisbury continues with the statement, "With saliva used as a buffer, masticatory stresses have no effect on the restorations." In the February issue of the *Journal of the American Dental Association* there was published an article on wear of acrylic teeth by Mr. John R. Beall, Research Associate of the American Dental Association at the National Bureau of Standards. The experiments there are far from being in accord with such a conclusion. On page 256, it may be noted that after several months' wear, "Close examination of the first and second bicuspid and first molar reveals the almost complete loss of anatomic detail in these teeth."

The table accompanying that research report is reproduced here to show not only that there is wear despite the saliva, but that there is sufficient wear to warrant Mr. Beall's closing with this sentence: "Until such time as reliable data are available, as a basis for judgment, it is suggested that the practitioner continue to warn his patients that acrylic resin teeth are 'experimental' rather than permanent."

Regarding Ball Bearings

Doctor Salisbury further comments: "Some of the best ball bearings are made from rubber, and the Brinell hardness of that substance is low." It would be interesting to learn the source of this information. My inquiries directed to all the large and well known ball bearing companies in this country elicited the reply that ball bearings are still made of steel, the harder the better. It is known that the cages or separators that retain the balls in relative positions have been made of mica or such plastics as micarta, or even a hard grade of paste board, but the ball bearings are made of steel.

New Departure, a roller bearing Division of General Motors Corporation, Bristol, Connecticut has, in part, this to say: "We have not seen the statement in the dental journal to which you refer, but we can assure you that ball bearings intended for load carrying and long service are made of nothing but the finest high carbon chrome alloy steel obtainable. Even where ball bearings may be made of stainless or corrosion resistant steel for special purposes, their load capacity is considerably reduced."

The Bantam Bearing Corporation, South Bend, Indiana, reports: "The balls and races are still of ball bearing steel . . . "

The Timken Roller Bearing Company, Canton, Ohio, says in part: " . . . In any event we do not know of any anti-friction bearing being made out of plastics."

The Chief Engineer of the Norma-Hoffman Bearings Corporation, Stamford, Connecticut says: "Replying to your letter of April 6th, we would advise that we do not manufacture ball bearings made of plastics nor do we know of any bearing company who is making such bearings."

Regarding Softening of Material in Mouth

"Softening of the material in the mouth does not occur as that author (Saffir) contends. Heat of 257° F. is required for softening of the material to occur, which is too hot for any

[1]Wherever mention is made in this article of a letter, or excerpts from a letter, or a publication, a chart, or any other piece of authoritative literature not commonly available, the original was sent with the manuscript of this article to the editor.

Table 1—*Physical Properties of Pure Methyl Methacrylate**

PROPERTIES	METHYL METHACRYLATE RESIN	
	Cast	Molding
Molding Qualities	Good	Excellent
Compression Molding Temp., ° F.	—	280-370
Compression Molding Pressure, lbs. per sq. inch	—	1000-3000
Injection Molding Temp., ° F.	—	325-500
Injection Molding Pressure, lbs. per sq. inch	—	10000-30000
Compression Ratio	—	1.6-2.2
Mold Shrinkage, inches per inch	—	Compression 0.001-0.005 Injection 0.003-0.006
Specific Gravity	1.18-1.20	1.16-1.20
Specific Volume, cubic inch per lb.	23.4-23.0	23.8-23.0
Refractive Index, nD	1.49-1.50	1.49-1.51
Tensile Strength, lbs. per sq. inch	6000-10000	4000-7000
Elongation, percent	1-5	5-15
Modulus of Elasticity in Tension, lbs. per sq. inch × 10^5	4-6	—
Compressive Strength, lbs. per sq. inch	11000-13000	10000-15000
Flexural Strength, lbs. per sq. inch	10000-15000	10000-15000
Impact Strength, ft. lbs. per in. of notch ½ × ½ in. notched bar, Izod test	0.2-0.4	0.2-0.4
Hardness, Brinell No. (2.5 mm. ball, 25 kg. load)	18-20	18-20
Hardness, Rockwell	M65-M85	M60-M90
Thermal Conductivity, 10^{-4} cal. per sec. per sq. cm./1° C. per cm.	5-7	5-7
Specific Heat, cal. per ° C. per gram	0.35	0.35
Thermal Expansion, 10^{-5} per ° C.	8	8-9
Resistance to Heat, ° F. (continuous)	140-160	120-140
Softening Point, ° F.	150-255	150-230
Distortion under Heat, ° F.	155	125-160
Volume Resistivity, ohm-cms. (50% relative humidity and 25° C.)	10^{15}	10^{15}
Dielectric Strength, short-time volts per mil, ⅛ in. thickness	500	500
Dielectric Strength, step-by-step volts per mil, ⅛ in. thickness	400	400
Dielectric Constant, 60 cycles	3.5-3.7	3.0-3.7
Dielectric Constant, 10^3 cycles	3.0-3.2	3.0-3.5
Dielectric Constant, 10^6 cycles	2.7-3.2	2.8-3.3
Power Factor, 60 cycles	0.06-0.07	0.05-0.07
Power Factor, 10^3 cycles	0.04-0.07	0.06-0.07
Power Factor, 10^6 cycles	0.015-0.025	0.015-0.03
Water Absorption, 24 hrs., %	0.4	0.4-0.5
Burning Rate	Slow	Slow
Effect of Age	Practically nil	Practically nil
Effect of Sunlight	Very slight	Very slight
Effect of Weak Acids	Practically nil	Practically nil
Effect of Strong Acids	Affected only by oxidizing acids	
Effect of Weak Alkalies	Practically nil	Practically nil
Effect of Strong Alkalies	Practically nil	Practically nil
Effect of Organic Solvents	Soluble in ketones, esters and aromatic hydrocarbons	
Effect on Metal Inserts	Inert	Inert
Machining Qualities	Fair to excellent	Excellent
Clarity	Transparent (90-92% light transmission)	
Color Possibilities	Unlimited	Unlimited

*Reproduced through the courtesy of Plastics Catalog Corporation.

Table 2—*Wear* of Acrylic Resin Teeth*

Reprinted from Progress Report to Research Commission of the American Dental Association by Beall, J. R.: Wear of Acrylic Resin Teeth, J.A.D.A. 30:255 (February) 1943.

Case	Tooth	Loss of Vertical Dimension† in Thousandths Inch on Cusps as Indicated			
		Mesial-Buccal	Mesial-Lingual	Distal-Buccal	Distal-Lingual
No. 17 upper 4 months service	Right 2nd molar	0	7	1‡	
	Right 1st molar	2‡	10	1‡	9
	Left 2nd molar	6	13	6	
	Left 1st molar	1‡	7	0	5
	Left 1st bicuspid	Lingual 2	Buccal 0		
No. 17 lower	Right 1st molar	5	2	5	3
	Left 2nd molar	4	4	6	4
	Right 2nd bicuspid	Buccal 0			
No. 19 upper 7 months service	Right 2nd molar	8	8	5	6
	Right 1st molar	6	18	5	7
	Left 2nd molar	6	21	7	
	Left 1st molar	12	28	15	8
	Right 2nd bicuspid	Lingual 10	Buccal 10		
	Left 1st bicuspid	Lingual 19	Buccal 16		
No. 19 lower	Left 2nd molar	12	4	17	4

*As represented by loss of vertical dimension.
†From differential measurement on stone replicas (reference point to high point of each cusp).
‡Vertical dimension greater after service. The probable accuracy of determinations is ±0.005 inch.

mouth." The reader is again asked to refer to Table 2, the result of the Bureau of Standards' experiments to see what actually happens. The effect will be noted on the mesial-buccal cusps of the upper right molar and upper left first molars, as well as the disto-buccal cusps of the upper right second molar and upper right first molar in Case 17. After this denture was worn for four months, four cusps were found to be actually longer than when the denture was put into the mouth. That is "flow," and that is due to the plastic's having been softened at mouth temperature or food temperature. Naturally, when the temperature is high enough, the flow will be obvious to lay eyes, and it will not require the skill of the highly trained dentist to recognize.

Color Changes

With regard to color changes, Doctor Salisbury says, "Color changes do not occur, unless the restoration is porous and it absorbs whatever enters the mouth. This is due to a faulty technique." This statement is perhaps best answered by the article on darkening of acrylic restorations in the February issue of the *Journal of the American Dental Association* by Doctor Vincent M. Johnson, instructor in pediodontia at Northwestern University Dental School.

Conclusion

It is my belief that few men who have examined, by instrument, acrylic in constant use in the mouth, will make the statement that the acrylic retains its color in the mouth. In a tooth, even a minute change, for instance, would alter the intended color effect. As a dentist who has practiced for many years, I feel keenly, the need for a fine plastic for use in the mouth, but it must be one that will stand up under the conditions found in the mouth. My knowledge of the physical properties of acrylics causes me to discourage their use for artificial teeth or occlusal surface restorations.

Enthusiasm cannot improve a material or the dentist. Many a material that only five or six years ago was acclaimed to have "life-long beauty and permanence" in denture construction cannot now be found on a dealer's shelves. I must continue to recommend caution and conservatism in the use of acrylics.

119 Quentin Street.

THE COVER

This month's cover photograph was taken at Bellevue Hospital in New York. Doctor Leo Winter, Professor of Oral Surgery, New York University, and Director of Oral Surgery at Bellevue Hospital, is operating. The operative procedure is for the application of the Roger Anderson appliance for the treatment of the mandible. By this procedure directly following the coaptation and fixation of the jaw, the patient is enabled to open his mouth, and to eat.

The Editor's Page

SIX YEARS AGO Armstrong and Huber[1] published an article in this magazine in which they evaluated the effects of high altitude flying on the human teeth and dental restorations. This was one of the first articles on the subject of aviation dentistry. These investigators could find no evidence to substantiate the theory that flights at high altitude cause the loss of dental restorations or deterioration of the teeth and dental restorations subsequent to a series of flights. The teeth as well as other tissues are subject to three distinct environmental variations at high altitudes: (1) decreased barometric pressure; (2) increased oxygen percentages; (3) lowered atmospheric temperatures. Armstrong and Huber concluded that the decreased barometric pressure could have no harmful effects on normal tooth structure or good restorations; that the increased oxygen could only produce an oxidation of dental restorations; and that lowered temperatures of a harmful degree could not be tolerated by any tissues for a considerable period (the soft tissues of the body would succumb to refrigeration before the hard dental tissues would); that the environmental conditions encountered at altitudes between 10,000 and 40,000 feet in addition to the inhalation of oxygen cooled to a maximum of —60° F. have no deleterious effect on human teeth or dental restorations.

More recently, Lieutenant Q. A. McCune[2] of the U. S. Navy Medical Corps in addressing the Institute of War Medicine and Surgery for Dentists in Chicago pointed out that acute exacerbation of low grade dental periapical infections may follow high altitude flying. He explained the phenomenon on the basis of Boyle's Law: The volume of a gas is inversely proportionate to the pressure exerted on it. McCune concluded that the expansion of air in an abscess cavity results from a decrease of barometric pressure at high altitudes and that this expansion may produce dental pain.

Another group of Naval Dental and Medical Corps officers[3] observed the behavior of aviation cadets in the low pressure chamber at the Naval Air Station Base at San Diego. They found the incidence of toothache as 1.2 per cent among the young men subjected to low pressure. Although this is a small percentage, it should be kept in mind that the subjects are among the most perfect physical types in the population. The greatest number of dental pains occurred at the higher altitudes: 51 per cent of those experiencing dental pain did so at 28,000 feet; 23 per cent at 18,000 feet; 20 per cent at 10,000 feet or less. These investigators describe three types of dental conditions which give rise to symptomatic pain during low pressure chamber runs: (1) pain caused by the reaction of vital pulps in carious teeth to the change in atmospheric pressure; (2) pain caused by the reaction of degenerated gangrenous pulps to the change in atmospheric pressure; (3) the existence of a faulty dental restoration with a small underlying residual air space. "Upon exposure to lowered atmospheric pressure the air in this space will cause pressure stimulation of nerve endings with resultant pain and occasionally expelling the inlay." These authors conclude that "pain symptoms of dental origin as revealed in the low pressure chamber may at times assist in disclosing hidden degenerative or gaseous processes affecting the normal functioning of an individual under certain conditions of varying altitudes."

The approach has been different in each of the three studies cited. Armstrong and Huber were interested in the harmful effects of high altitudes on the dental hard tissues and restorations. McCune was thinking in terms of the changes in chronic periapical infectious processes as a result of the lowering of barometric pressure; whereas Joseph and his co-workers[3] approached the subject from the standpoint of pulp behavior. They concluded that the "nature of the histologic structures of the teeth allow little compensation for circulatory or gaseous volume changes within the confined area of the pulp chamber, root canal, or apical alveolar structure."

These studies suggest that a wide field of research is open in aviation dentistry and that qualified people should make further studies of the subject to coordinate and evaluate the various points of view.

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[1]Armstrong, H. G. and Huber, R. E.: Effect of High Altitude Flying on Human Teeth and Restorations, DENTAL DIGEST, 43:132 (March) 1937.

[2]McCune, Q. A.: Aviation Medicine: Physiologic Aspects of High Altitude Flying in Lectures on War Medicine and Surgery for Dentists, Chicago Dental Society, 1943.

[3]Joseph, T. V.; Gell, C. F.; Carr, R. M., and Shelesnyak, M. C.: Toothache and the Aviator, U. S. N. Med. Bull. 41:643 (May) 1943.

The Occlusal Rest in Partial Denture Construction

J. ARTHUR MALCOLM, D.D.S., Pittsburgh

DIGEST

Occlusal rests are the most important integral parts of partial dentures and in large measure determine the successful functioning of the restoration.

The directions of the forces against which resistance must be provided for the artificial restoration and its abutments are (1) the thrust gingivally and the pull occlusally; (2) labial, buccal, and lingual-lateral thrusts; (3) mesial and distal thrusts; (4) labio-lingual, linguo-labial, bucco-lingual, linguo-buccal, mesio-distal and disto-mesial torc or rotary force in both a horizontal and vertical plane.

The ideal place for occlusal rests is at the most distal and mesial termination of edentulous areas on each side of the dental arch. It is proposed to prepare the occlusal rest seats so that the rests will cleat the partial restoration, to resist all lateral and mesio-distal thrusts.

As much tooth enamel as possible should be preserved and the support of the transverse ridges and marginal ridges must be retained in a preparation that combines the desirable features of the usual shapes of occlusal rest preparations and eliminates the undesirable features. A technique for such a preparation is outlined and illustrated.

WHAT MUST A partial denture be, what must it do, to be termed a successful partial denture restoration? It must restore lost anatomy resulting from extractions. It must restore and maintain intermaxillary relationships. It must carry the load formerly carried by structures lost. It must take over and efficiently execute the functions of incising, tearing, breaking and triturating food. It must maintain the relationship of the remaining teeth in the arch. It must not exert destructive forces on the remaining natural teeth and their investing structures, but rather must protect these structures against the forces that would have resulted in their loss had no prosthetic restoration been attempted. It is my belief, furthermore, that occlusal rests are the most important integral parts of partial dentures and in large measure determine the successful functioning of the restoration.

If occlusal rests are cast or formed to fit accurately into prepared seats of proper shape and proper dimension, and properly positioned, resistance to all forces exerted during mastication will be obtained with the least possible strain upon the natural abutments. Leverage exerted by other clasp arms on abutment teeth will be reduced to a minimum as their only function would be the retention of the occlusal rests in position against displacement along the path of insertion of the partial denture. It naturally follows that breakage of clasp arms would be reduced as the forces they were to resist would be decreased.

Directions of Forces

Briefly, the directions of the forces against which resistance must be provided for the artificial restoration and its abutments are as follows: (1) The thrust gingivally and the pull occlusally; (2) labial, buccal, and lingual-lateral thrusts; (3) mesial and distal thrusts; (4) labio-lingual, linguo-labial, bucco-lingual, linguo-buccal, mesio-distal and disto-mesial torc or rotary force in both a horizontal and vertical plane.

Method of Establishing Support

Although there are three primary types of dental arches: square, oval and tapering (Fig. 1), in tracing a line about the arch through the buccal cusps of the posterior teeth and over the incisal edges of the anteriors, tying this in with a line from the most distal molar across to the molar on the opposite side of the arch, a figure is drawn which is roughly a pentagon. Although the anterior teeth may not be involved in the case, we cannot reduce the outline of the case to less than a quadralateral figure in bilateral cases. Any attempt, therefore, to support the restoration on three occlusal rests, or less, against thrust gingivally, would place some part of the restoration, against which this pressure would be exerted, outside of positive support, and immediately a leverage would be created with two of the rests forming a fulcrum and throwing the restoration into strain.

The problem is similar to that of establishing support for a rectangular table, from which the central portion of the top has been removed (Fig. 2). To bear weight at all points, the table must be supported on four legs, as the bilateral restoration must be supported on four occlusal rests, and these must be so located that pressure exerted on replacement teeth will fall between two rests on any given line of the quadralateral case. The ideal place for occlusal

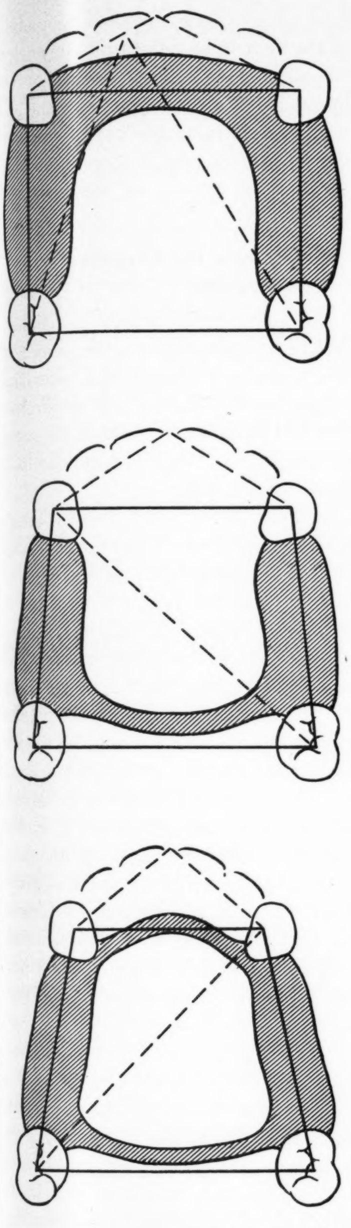

Fig. 1—Types of dental arches: square, oval and tapering. In tracing a line about the arch through the buccal cusps of the posterior teeth and over the incisal edges of the anteriors, and connecting this line with a line from the most distal molar across to the molar on the opposite side of the arch results in a pentagon. This demonstrates that at least a quadralateral figure is necessary for the outline of the case in bilateral cases. Three occlusal rests to support the restoration will not be adequate.

rests, therefore, is at the most distal and mesial termination of edentulous areas on each side of the arch (Fig. 3). In distal extension saddle cases, extend the saddles to supports on the mandibular

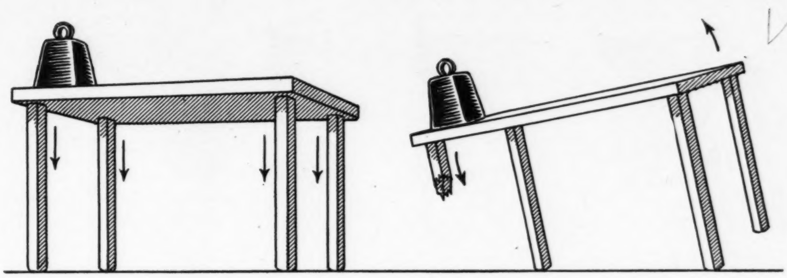

Fig. 2—Table serves as an analogy to demonstrate necessary support.

tuberosities, and distal to maxillary tuberosities.

To continue the table analogy: If the table were on shipboard, it could slide about and turn in all directions as the ship's roll would cause an inclination of the decks; however, if the legs of the table were slipped into cleats on the deck, it would be supported against lateral motion also. The only direction in which the table might be moved, then, would be upward out of the supporting cleats (Fig. 4). It is therefore proposed to prepare the occlusal rest seats so that the rests will cleat the partial restoration, to resist all lateral and mesio-distal thrusts.

Usual Shapes of Occlusal Rest Preparations

Let us consider some of the shapes prepared for occlusal rests (Fig. 5).

1. *Bowl Shape*—There is the bowl shape preparation, such as would result from the use of a round stone or wheel (Fig. 5, A). This provides little stability and if used in a unilateral restoration, in conjunction with its fellow rest at the other end of the edentulous span, would form an axis around which the restoration might rotate bucco-lingually in a vertical plane and vice versa. This form of rest does have the advantage of permitting an individual freedom of motion to the abutment upon which it is placed.

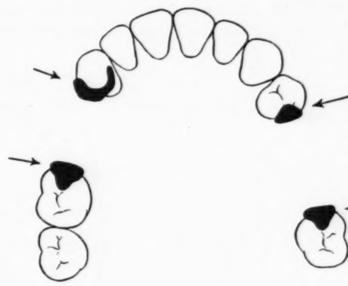

Fig. 3—The ideal place for occlusal rests is at the most distal and mesial termination of edentulous areas on each side of the arch.

2. *Block or Cube Shape*—The block or cube shape (Fig. 5, B) is sometimes prepared in inlays or other abutment restorations. This provides the ideal flat floor for support against gingival thrust and its vertical lateral walls insure ideal resistance against lateral thrust. But, it has the disadvantages of (a) causing absolute fixation of the abutment tooth to the partial restoration, which results in trauma to the abutment; (b) necessitating the paralleling of the lateral walls of all rest preparations; (c) limiting the path of insertion of the restoration to a plane paralleling the lateral walls of the rest seats; and (d) creating line and point angles. Such angles make

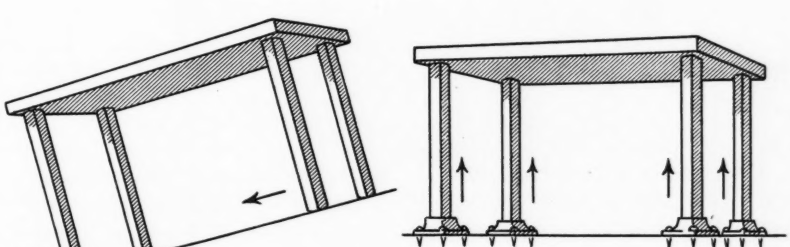

Fig. 4—Table held by cleats demonstrates the proposed method of preparing occlusal rest seats; namely, so that the rests will cleat the partial restoration so as to resist all lateral and mesio-distal thrusts.

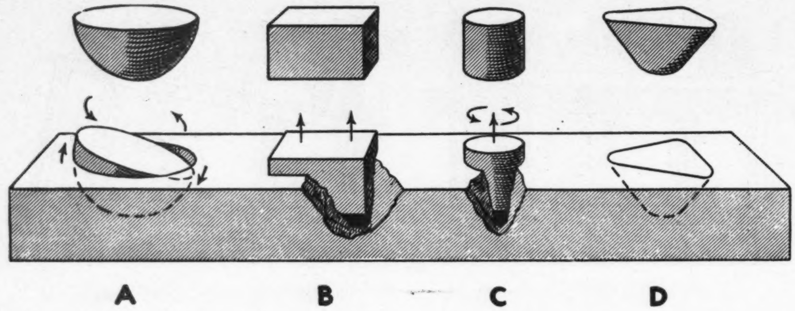

Fig. 5—Usual shapes of preparations for occlusal rests. A, Round stone or wheel shape; B, block or cube shape; C, cylindrical or tube preparation; D, modified wedge.

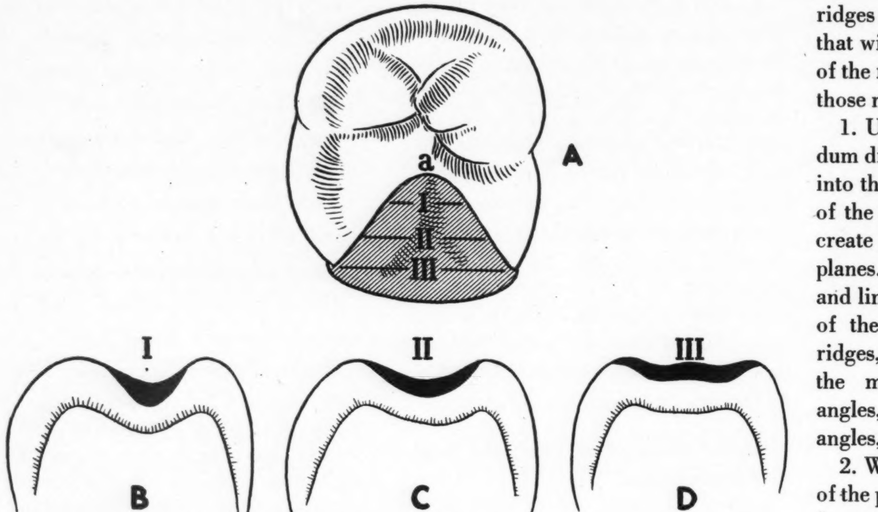

Fig. 6—Proposed tooth preparation for occlusal rest. A, Line of slice into mesial or distal inclined planes of triangular ridges; B and C, rounding of floor of preparation in mesial or distal fossa, to eliminate sharp angles at junction of floor and side cuts; A-a, rounding of central terminus of preparation. D, marginal ridge ground to provide a wide flat seat bucco-lingually; all sharp angles eliminated by discing over onto proximal surface.

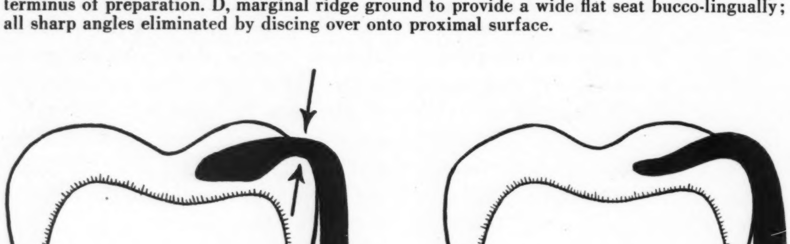

Fig. 7—A, Arrows indicate reduction of prominent marginal ridges, so that bulk of occlusal rest need not be reduced as it passes over ridge; B, proper preparation with just enough prominence in marginal ridge to permit a dipping into occlusal fossa.

efficient prophylaxis extremely difficult.

3. *Cylindrical or Tube Preparation*—The cylindrical or tube preparation (Fig. 5, C), which like the cube preparation is frequently prepared in inlays, provides good support to both gingival and lateral thrust, but although it permits some freedom of movement of a rotary type in the horizontal plane to the abutment tooth, it permits no bucco-lingual freedom in the vertical plane.

4. *Modified Wedge*—The modified wedge (Fig. 5, D), prepared by cutting the inclined planes of the triangular ridges to a steeper incline, provides an acceptable resistance to lateral thrust, but owing to a narrowing and rounding of the floor to avoid abrupt line angles, affords a poor support against bucco-lingual rotation in a vertical plane and vice versa in unilateral cases; however, this form does permit a reasonable individual movement of the abutment tooth.

Technique for Proposed Preparation

As much tooth enamel as possible should be preserved and the support of the transverse ridges and marginal ridges must be retained in a preparation that will combine the desirable features of the rest seats described and eliminate those not desirable.

1. Using stone points and carborundum discs of a size to suit the case, slice into the mesial or distal inclined planes of the triangular ridges at an angle to create a steeper inclination of these planes. This cut should begin just buccal and lingual to the junction of the crests of the buccal and lingual triangular ridges, the line of cut diverging toward the mesio-buccal and mesio-lingual angles, or disto-buccal and disto-lingual angles, as the case may be (Fig. 6, A).

2. With stone points, round the floor of the preparation in the mesial or distal fossa, eliminating any sharp angles at the junction of the floor and side cuts (Fig. 6, B and C), and round the central terminus of the preparation (Fig. 6, A-a).

3. Taking care not to cut too deeply, grind the marginal ridge to provide a wide flat seat bucco-lingually and eliminate all sharp angles by discing over onto the proximal surface (Fig. 6, D).

It is important that more prominent marginal ridges be sufficiently reduced, so that the bulk of the occlusal rest is not reduced as it passes over the ridge as shown in Fig. 7, A. Fig. 7, B illustrates a proper preparation with just enough prominence in the marginal ridge to permit a dipping into the occlusal fossa. In unilateral cases the bucco-lingual width of the preparation in the marginal ridge area should be such that lines drawn mesio-distally through the buccal and lingual cusps of the artificial replacement teeth would fall within the margins of the occlusal rest (Fig. 8).

The reason for this is illustrated in Fig. 9, A and B. Owing to the extreme

narrowness of contact between the balance arm and its vertical support, the lightest weight placed on one side of the scale causes a rotation around the fulcrum point F in Fig. 9, A. As the diameter of the vertical support is increased, as in Fig. 9, B, it takes increasingly greater weights on each side of the vertical support to rotate the horizontal arm, and forces exerted within the area DD (representative of the area between the buccal and lingual cusps of the artificial replacement teeth) result in no movement of the horizontal arm.

4. *Supplementary Occlusal Rests*—Unfortunately it is often necessary to construct unilateral cases in which one or both abutments may be rotated out of normal alignment. By resorting to supplementary occlusal rests through the bucco-occlusal or linguo-occlusal grooves of the molars, or in the remaining occlusal fossa of the bicuspids, it is possible to stabilize the restoration against bucco-lingual or linguo-buccal rotation in the vertical planes (Fig. 10).

Inasmuch as a force applied at an angle to a plane causes a pressure perpendicular to the plane, it is desirable that the floor of the occlusal seats be as nearly as possible at right angles to the direction of direct masticatory stress and as nearly as possible at right angles to the long axis of the tooth. Failure to comply with this fundamental mechanical fact frequently results in the mesial or distal shifting of abutment teeth (Fig. 11). This brings up the problem of how to support the restoration and protect the abutments which may have tilted either mesially or distally toward the edentulous area (Fig. 12). Some operators in order to restore occlusion with opposing teeth resort to onlays in which occlusal seats are prepared at right angles to masticatory stress. Such treatment frequently results in further tilting of the malposed abutment (Fig. 13). Other operators cast occlusal pads as an integral part of the partial restoration. It is my opinion that this treatment affords a better support to the restoration and lessens the tendency to tilt the abutment further as a result of counteracting forces exerted on the several planes of the occlusal surface (Fig. 14); however, the coverage of so much tooth structure normally exposed to cleansing by the sweep of food over the surface precludes its application in patients susceptible to caries or less fastidious about mouth hygiene.

The best solution I have found for this problem is to restore occlusion by means of an inlay-onlay, totally independent of the partial restoration, and to prepare the seat for the occlusal rest

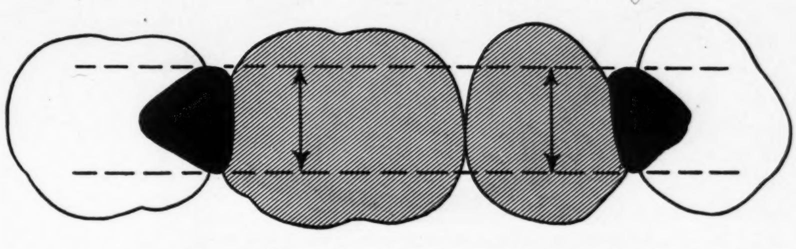

Fig. 8—In unilateral cases bucco-lingual width of preparation in marginal ridge area should be such that lines drawn mesio-distally through buccal and lingual cusps of artificial replacement would fall within margins of occlusal rest.

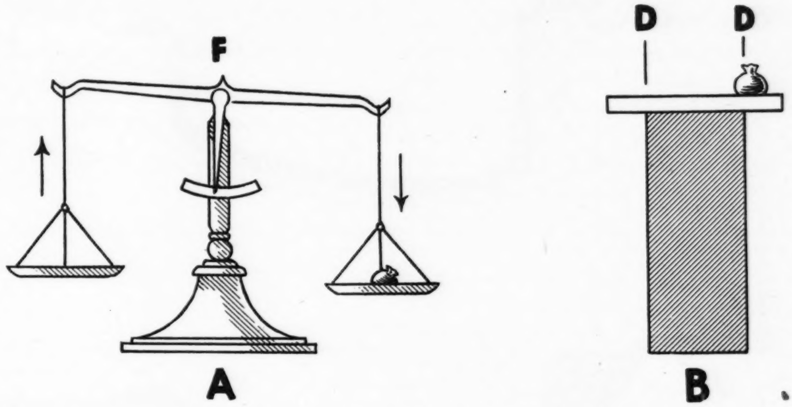

Fig. 9—Lightest weight placed on one side of scale, A, causes a rotation around fulcrum, F, owing to extreme narrowness of contact between balance arm and its vertical support; B, as diameter of vertical support is increased, it takes increasingly greater weights on each side of support to rotate horizontal arm; DD, representative of area between buccal and lingual cusps of artificial replacement; forces exerted within this area do not result in movement of horizontal arm.

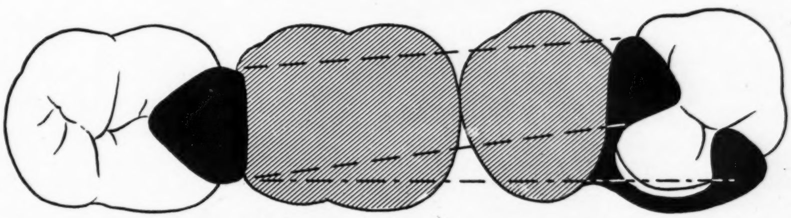

Fig. 10—Supplementary occlusal rests employed to stabilize restoration against bucco-lingual or linguo-buccal rotation in the vertical.

Fig. 11—Shifting of abutment teeth caused by failure to have floor of occlusal seats at right angles to direction of direct masticatory stress and to long axis of tooth.

Fig. 12—Abutments tilted toward edentulous area.

Fig. 13—Use of supportive onlays to restore occlusion which results in further tilting of malposed abutment.

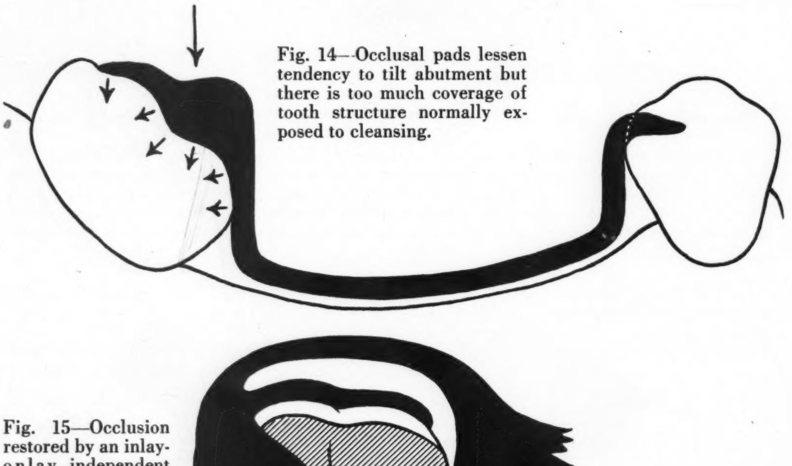

Fig. 14—Occlusal pads lessen tendency to tilt abutment but there is too much coverage of tooth structure normally exposed to cleansing.

Fig. 15—Occlusion restored by an inlay-onlay, independent of partial restoration. A, Clasp arms reversed; B, distal portion of saddle carried within undercut at mesial of molar.

in the distal fossa of the molar, reversing the clasp arms, as shown in Fig. 15, A. The saddle portion of the restoration supports the abutment against movement mesially. At times, other factors prevent doing so; but usually further support against mesial tilting can be obtained by surveying the case for a path of insertion that will carry the distal portion of the saddle within the undercut at the mesial of the molar (Fig. 15, B).

5. *Anterior Rests*—The contours of the anterior teeth and the requirements of esthetics make the preparation of suitable rests on incisors and cuspids a more difficult problem. A wide variation in the conditions precludes the standardization of rest forms and positions. It is desirable that any forces directed upon these teeth be parallel to their long axis and, therefore, the floor or main support should be cut at right angles to the long axis of the teeth. It is sometimes possible to prepare a rest in the distal slope of the incisal edge of cuspids which will give ample support to the restoration with the minimum destruction of tooth structure. This rest seat is prepared by stoning into the incisal enamel to a depth that will establish a surface at right angles to the long axis of the tooth, as indicated by the dotted line in Fig. 16, A. The sharp angles caused by this cut are eliminated by cutting a rounded bevel onto the labial and lingual surfaces. A cross section of this rest is shown in Fig. 16, B. Actually, the rest form is a channel which affords considerable strength with a minimum bulk of material and aids in supporting the abutment against rotation.

I believe the practice of rounding off the mesio-incisal or disto-incisal angles of incisors to provide space for interproximal dual rests to be inadvisable. The removal of sufficient enamel to provide positive support to the restoration, as shown in Fig. 17, A, would weaken the tooth considerably, or a simple slicing of the angle onto the proximal surface, as shown in Fig. 17, B, would result in a wedging force that would move the tooth to the mesial or distal.

The problem of anterior rests is simplified when caries necessitates cast restorations in anterior abutments, as we can then predetermine the type of rest desirable in a given case and select

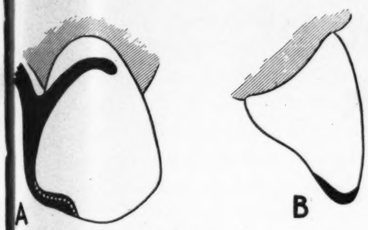

Fig. 16

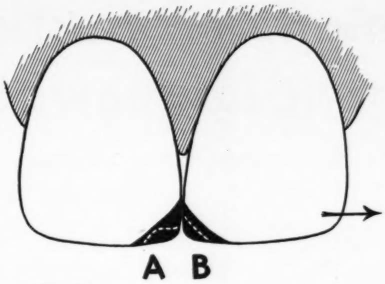

Fig. 17

Fig. 16—Preparation of rest seat in distal slope of incisal edge of a cuspid. Dotted line in A indicates depth of stoning into incisal enamel to establish a surface at right angles to long axis of tooth; B, cross section of rest.
Fig. 17—A, Tooth weakened by removal of sufficient enamel to provide support to restoration; B, slicing of angle onto proximal surface results in movement from wedging force.

the type of abutment restoration that will best support it. Conditions present in the individual mouth requiring a partial restoration must dictate the selection of rest types prepared in tooth restorations, the more common of which are simple ledge rests, ball rests, and pin rests.

343 Vanadium Road.

Suggestions for Improved Direct Technique for Methyl Methacrylate

GREGORY B. SALISBURY, D.D.S., Philadelphia

SINCE THE publication of my articles in January, February, and March issues of this magazine, correspondence with readers has indicated varying and sometimes troublesome results with the application by the direct method of methyl methacrylate to the tooth. I wish to repeat that the direct method is still in its experimental stage and was introduced to the profession to stimulate further experimentation.

1. A slight excess of monomer will produce poor results in anterior teeth, because the acrylic resin will stick to the celluloid.

2. If a taste of the monomer persists, too much liquid has been used. The polymer should be moistened until the whole alters in color to resemble wet sand. The material should not glisten with any excess. Surface hardness at first will not be excessive, because only the outer skin of the acrylic resin will be tough. The deeper layers take a while to harden, thus a restoration tested with an instrument the first day of insertion can be dented. The patient should be advised to eat on the opposite side until the following day.

3. For class I and II restorations, use a hydrophillic cellophane over the mass and compress with the finger for five minutes. The patient should keep the mouth dry for twenty-five minutes more before the cellophane is moistened; the cellophane will then easily peel off. Lubricate with cocobutter. Have the patient wait in the reception room for a half hour and then carefully trim off the excess which may interfere with occlusion.

4. For class III restorations the technique is the same as originally described except that hydrophillic cellophane is adapted over the restoration and this is compressed with the celluloid strip to prevent sticking of the acrylic material to the strip. Complete as for class I and II.

5. Again, the only alteration for class IV restorations is to allow the celluloid corner to remain in place just as is done with the copper band. After a few days, disc the celluloid corner off; do not attempt to pull it off; disc it off with a lubricated sandpaper disc.

6. For class V cavities likewise the hydrophillic cellophane is adapted over the mass and compressed by the tubular matrix. After five minutes, peel off the tubular matrix; and the cellophane is allowed to remain for twenty-five minutes more as recommended here in suggestion 3.

The operator is cautioned against gingival excess aprons. Adopt cellophane and tubular matrix, so as to prevent its occurrence. After a twenty-five minute wait, hold a finger over the cellophane, at the filling area, and cut off the gross excess with a sharp scalpel, teased under the cellophane. Do not pull on the restoration.

Comments

In all types of restorations, bulk is imperative, likewise plenty of retention. Doughy mixes should not be used, as these will remain elastic and will pull out. Sandy mixes are difficult to handle but after several direct restorations on extracted teeth, there should be little difficulty working in the mouth. Try an occlusal first, and more difficult types later. Pack the acrylic into cavities with plenty of pressure, to insure proper condensation. Allow for excess, as there will be a porous surface, which should be trimmed.

Dentists are urged to experiment further to find the right accelerator for a doughy mix, or a suitable instrument to harden the acrylic more rapidly.

Chatham Court, Section B.

Simplified Construction of Acrylic Bridgework

A. H. TAMARIN, D.D.S., Chicago

DIGEST

The resiliency of the acrylics tends to dislodge the material from its anchorage. In bridgework, because of the bucco-lingual bulkiness of the pontics and the mesiodistal distance occupied by the pontics, security depends on the connecting rod between the abutments. A technique is therefore presented for the construction of a suitable rod which will assure safety in the use of acrylic material for bridgework.

ACRYLIC BRIDGEWORK is still in its experimental state. Outside of the time element which is not in its favor, the greatest difficulty is to overcome its resiliency. This particular property has a tendency to dislodge the material from the anchorage upon which it is attached. In order to overcome this difficulty, many steps in different directions have been taken; for instance, in the case of jacket crowns, greater density of the material as well as a metallic coping contributed greatly to the security of the crown. In bridgework, however, such steps are of little or no value. Owing to the bucco-lingual bulkiness of the pontics as well as to the distance that the pontics occupy mesio-distally in extensive restorations, the security of the material depends largely on the intricacy of the rod that connects the two abutments. It is necessary, therefore, to construct a rod that will guarantee safety in the use of acrylic material for bridge purposes.

Technique

It is necessary to have a semicircular German silver wire (or wire of precious metal) 1 mm. in thickness by 2 mm. in

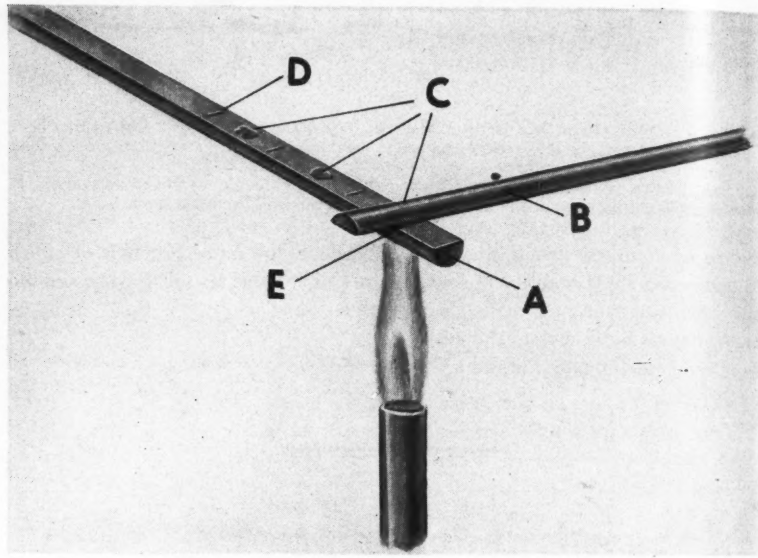

Fig. 1—Construction of rod by soldering loops upon it. Each loop indicates the center point of a proposed pontic.

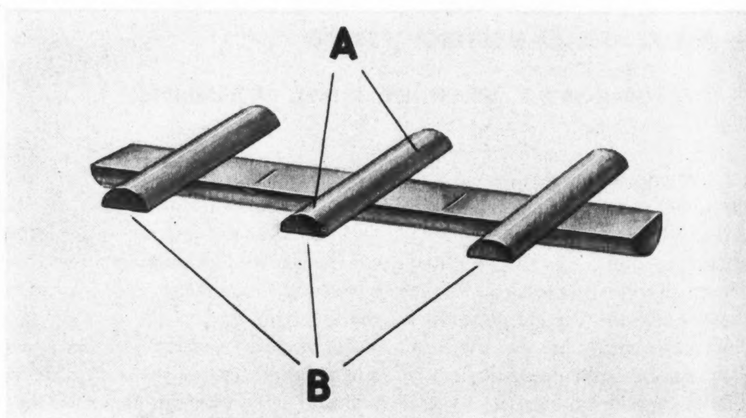

Fig. 2—Single rod with loops or wings soldered upon it.

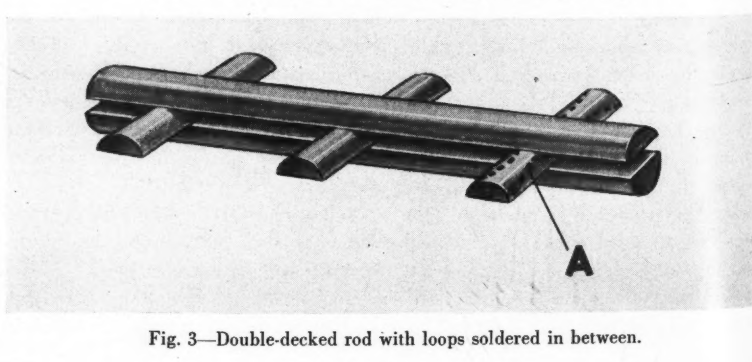

Fig. 3—Double-decked rod with loops soldered in between.

width, and 6 by 12 inches in length (Fig. 1, A), and another semicircular German silver (or that of a precious metal) .75 mm. in thickness by 1.75 mm. in width and 6 by 12 inches in length (Fig. 1, B):

1. Minute pieces of number 615 gold solder are prepared and fluxed.

2. After the abutments have been prepared, an impression is taken with the abutments in position and a cast of investment compound is made (Fig. 5, D).

3. With a millimeter gauge ascertain the distance between the two abutments (Fig. 5, B) and mark off the same distance on the thicker wire (Fig. 1, D). On this part of the wire determine the size of the spaces to be occupied by the teeth mesio-distally. On the flat side of the wire, at the center of each space for a proposed tooth (Fig. 1, C), place some liquid flux and pass the wire over the flame to have the flux fixed upon it.

4. Place minute pieces of gold solder over the flux area and fuse it over the Bunsen flame (Fig. 1, C).

5. After this has been done, place some liquid flux over the flat surface of the thinner wire (Fig. 1, B) 3 mm. away from the end of the wire (Fig. 1, E) and fix the flux upon its surface as described.

6. Place the flat surface of the thinner wire upon the flat surface of the thicker wire where the solder is located (Fig. 1, E). Hold these wires at the extreme ends of their opposite sides while introducing the other ends into the flame. Hold the wires in that position until they are soldered together.

7. With cutting pliers, cut off the thinner wire 2 mm. away from the thicker wire. This will leave a wing-spread of 2 mm. on each side of the thicker wire (Fig. 2, A).

8. This process is repeated over each area, where wings are to be soldered (Fig. 1, C). These small wings (Fig. 2, B) indicate the center points of each proposed acrylic pontic and are supposed to give strength bucco-lingually to each pontic.

9. After all the wings have been soldered into their proper positions, sever the thick wire at the point which marked the proper distance of the desired rod (Fig. 1, D). This will give a complete single bar (Fig. 2).

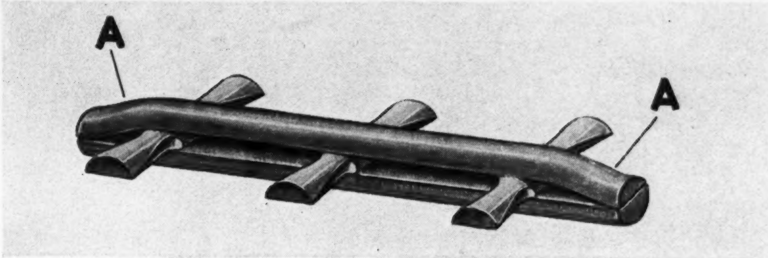

Fig. 4—Double-decked rod with ends bent together.

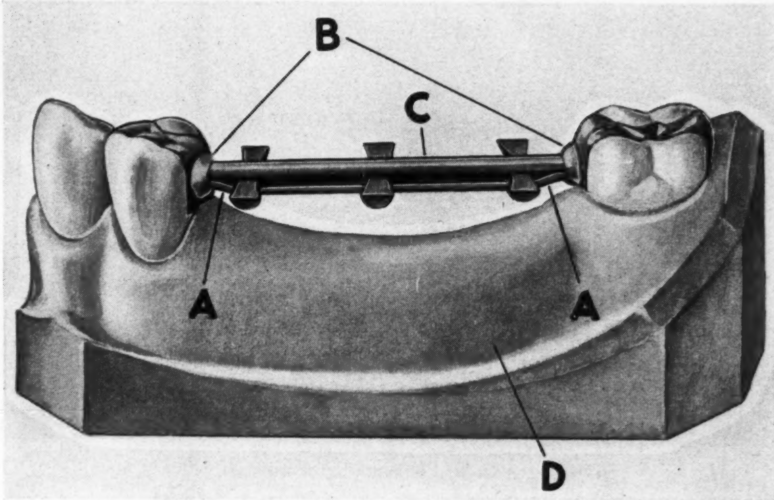

Fig. 5—Rod held in position by sticky wax between two abutments.

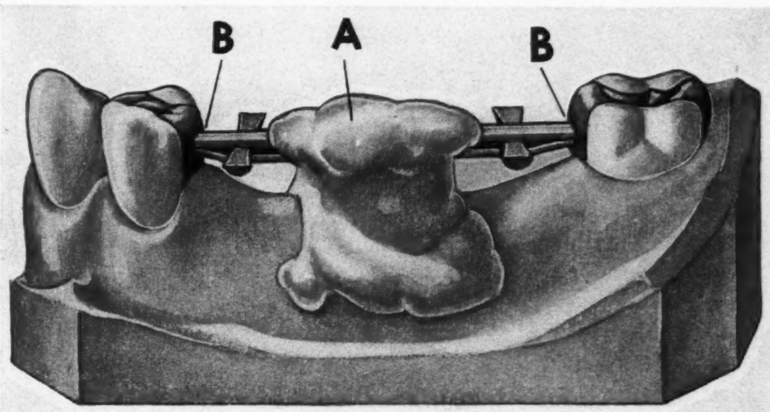

Fig. 6—Rod held in position by investment compound, the contact points being left exposed.

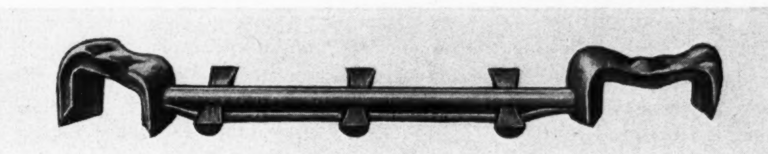

Fig. 7—Rod and abutments soldered together.

10. If the case presents a high bite a thicker rod may be employed. This kind of a rod is made by forming a double deck upon the completed single rod (Fig. 3). This will also present a greater anchorage for the acrylic pontics than

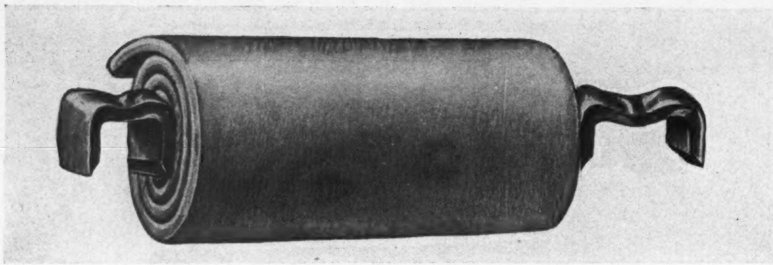

Fig. 8—Soft base-plate wax rolled around the rod between the two abutments.

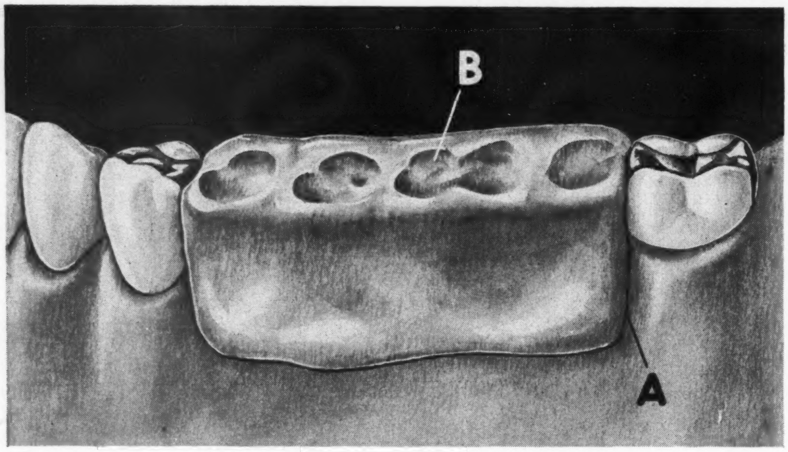

Fig. 9—Skeleton of bridge together with wax bite.

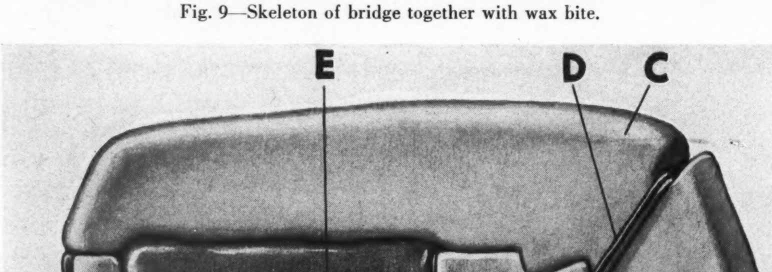

Fig. 10—Wax bite together with abutments mounted upon a plaster articulator.

the single rod will. The acrylic in this case will penetrate between the upper and lower deck, and will, therefore, assure greater strength. To construct the double-decked rod:

(a) Place upon the flat surface of the thinner wire some flux, and then solder and fuse it at the points where they will coincide with the round surfaces of the wings of the single rod (Fig. 2, B).

(b) Place the thinner wire with the soldered areas on the round surfaces of the wings of the second wire and solder them together over the Bunsen flame. This is accomplished by holding the two wires at their extreme and opposite ends.

(c) When this process is completed, separate the double rod from the main bodies of both wires (Fig. 3).

(d) With flat pliers force the two ends of the main wires of the double rod together. This will cause the thinner wire to bend first, forming a slight curvature on each end of the double rod (Fig. 4, A).

(e) Adjust the double rod to fit the space between the abutments, with the round ends facing toward the gum tissue (Fig. 5, A).

11. With a wax spatula apply a bubble of sticky or base-plate wax upon the mesial and distal surfaces of the two abutments where the rod is to be soldered (Fig. 5, B). After the wax has been solidified, slightly warm the rod and carry it into the proper position between the two abutments (Fig. 5, C). The heat of the rod will melt the wax slightly (Fig. 5, B), and when the wax is again solidified it will hold the rod in its proper position. The proper distance of the rod should always be midway between the alveolar process and the occlusal plane.

12. Invest the rod. In the palm of the hand, form a thin mixture of investment compound and with a small wax spatula, build up the investment compound drop by drop until the desired wall is formed. All the wings of the rod (Fig. 6, A) should be invested.

13. When the investment compound is crystallized, remove the wax that held the rod in position. This will expose the contact points where the abutments and rod meet each other (Fig. 6, B).

14. Introduce the model into the fire and solder the rod to the abutments.

15. Remove the soldered product from the investment compound and clean it (Fig. 7).

16. Cut a long piece of base-plate wax, slightly smaller than the size of the rod; soften it over the flame, and circle it around over the rod between the abutment (Fig. 8). Introduce it into the patient's mouth while it is soft and press it into position. See that the abutments fit in their proper places. This will give the impression of the gum tissue (Fig. 9, A). Instruct the patient to close the jaws firmly. This will give the impression of the occlusal surface of the opposing teeth (Fig. 9, B). Chill the wax and remove it from the mouth.

17. Mix some plaster and spread it lengthwise over a piece of paper. Place the wax bite with the gum impression over it. Have an extension of the plaster protrude posteriorly (Fig. 10, A).

18. When the plaster has crystallized, make a couple of deep cuts in the posterior projection of the plaster (Fig. 10, B) and cover it with a separating medium.

19. Mix some more plaster and cover it over the entire occlusal surface of the wax impression (Fig. 9, B), including the plaster extension of the lower cast (Fig. 10, C). This will form an individual articulator for each individual case.

20. To make the two sections of the articulator hold together, carve a notch in the upper and lower sections and pass a rubber band over it (Fig. 10, D).

21. Proceed with carving the teeth in the wax bite (Fig. 10, E).

22. When the carving is completed (Fig. 11, A), introduce it into the patient's mouth for adjustment.

23. When the final adjustments have been made, cover the gum surface of the plaster articulator with tin foil and place the bridge back over it.

24. Tin-foil the buccal and lingual surfaces of the wax teeth.

25. Cut off the extension of the plaster articulator.

26. The case is now ready to be invested in the flask.

Instead of tin-foiling the case, good results can be obtained by using a special separating medium.

27. After the bridge is properly invested (Fig. 12), the wax is boiled out and the case is properly packed with acrylic and pressed together in the flask.

28. The case is boiled in a container of water for fifteen or twenty minutes.

29. Remove the case from the flask and polish it with pumice (Fig. 13).

30. The case is ready to be cemented in the patient's mouth.

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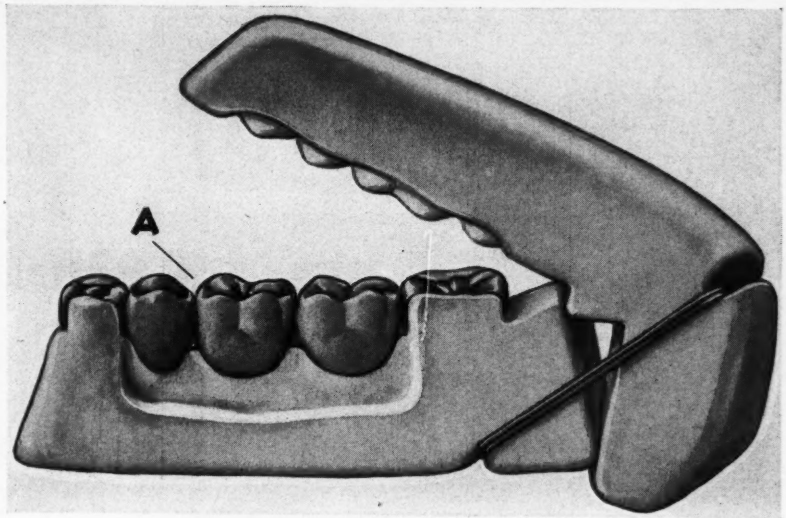

Fig. 11—Teeth carved out of wax bite.

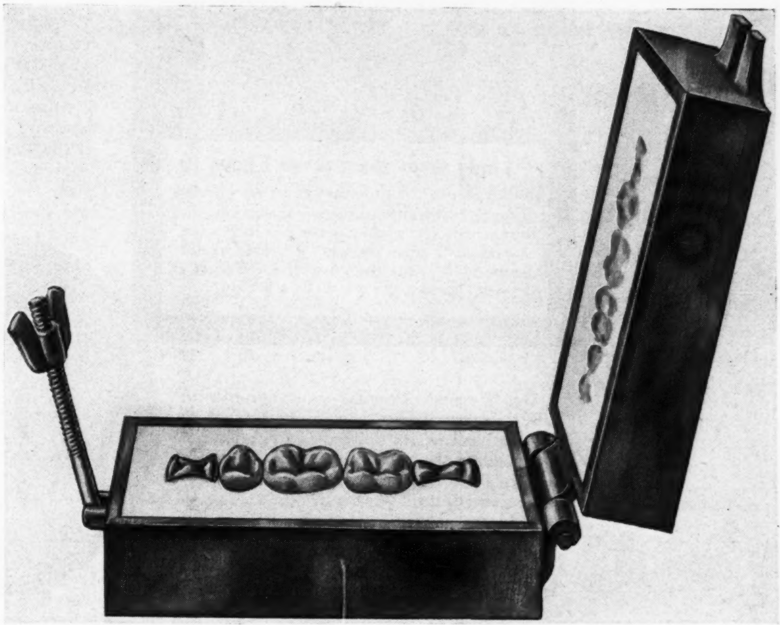

Fig. 12—Bridge together with wax teeth invested into flask.

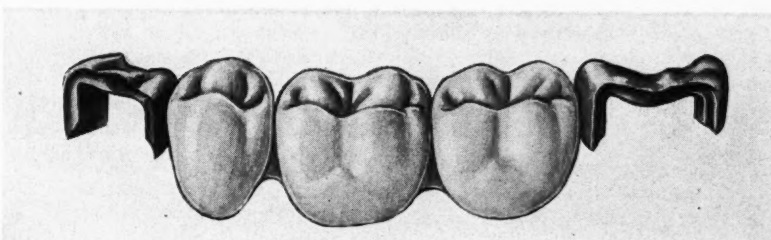

Fig. 13—Acrylic bridge completed.

Contra-Angles

For Those Under 45 . . .

Every release from the Procurement and Assignment Service portends that all dentists under 45 will soon be called for military service. We have been making this prediction in this column month after month. Some time ago, we suggested that every dentist under 45 be subjected to a final type physical examination to settle the question of physical fitness once and for all. The dentist who is found to be physically qualified could begin at once to put his affairs in order. He would know how to plan his retirement from practice so as to enter the service. On the other hand, the dentist who is found to be doddering and physically incapable for military service could remain in practice without the uncertainty of a call to service hanging over his head. He could relax in his soft slippers and arm chair when his work is done.

For the induction of men into the general military service the age limit is 38. The age limit for dental officers, however, is at present 42 with a pretty strong possibility of its being 45 before the summer is out. The threat is being raised once again that unless dentists come into the service immediately and in sufficient numbers, they will be inducted as privates. One of the strongest statements on this subject appeared in the May issue of the *Illinois Dental Journal*:

"All dentists under thirty-eight are subject to induction as privates unless they apply for and receive commissions. . . . Unless classification cards are properly filled out and filed with the state chairman, the liability of being inducted as a private is most certain and

there is no opportunity for the Procurement and Assignment Service to perform its intended function . . . .

On the Eating of Rabbits . . .

The usually formal and austere *Journal of the American Medical Association* publishes a letter to the editor on the edibility of the rabbits used in pregnancy tests. The correspondent apparently was worried about the meat shortage and sought to do his bit to improve the nutritional level of the country. The professor of obstetrics and gynecology who wrote this letter tossed in a little doggerel to clinch his argument. It is to be hoped that he is better at the accoucheur's table than with the poet's pencil which produced the following:

"If you're not a Babbit
You'll enjoy the rabbit
That entered into rest
To give a Friedman test.

"While it may seem funny,
You'll enjoy the bunny,
Who's done her double duty
For Victory and Beauty."

People with Vague Aches and Pains . . .

Orthodox medical science, including dentistry, is nearly always at a total loss to relieve the distress of the people who present with vague, indefinite, idiopathic aches and pains which usually attend middle life. Many of these symptoms are coincident with the climacterium. We have all seen such patients, with a pain in the neck or in the back or in the shoulder. The pain isn't severe enough to put the patient to bed but it does blight his life. Such creaking middle-aged cannot play as pleasurably as they used to and they cannot work as efficiently as they would like to work. They make the rounds of medical and dental specialists. They receive as many diagnoses as they have consultations. If they have eight different doctors, they have eight different diagnoses; each diagnosis is likely to be based on the current enthusiasm of the consultant who makes it. The patient may be diagnosed as being avitaminotic, as lacking in estrogens, as harboring foci of infection, or as struggling under neurotic

(*Continued on page* 273)

(*Continued from page 268*)

conflicts. The poor devils lose their teeth; they are filled with biochemicals; their glasses are changed; they are given orthopedic shoes to wear. But their aches and pains are always with them.

No class of person coming into the dental office is harder to treat. Their conditions are the hardest to evaluate. They may have pulpless teeth which show no roentgenologic or clinical evidence of disease. It is often difficult to decide whether they are better off with these teeth or without them. Unfortunately the decision is sometimes reached by the dentist with a glint in his eye toward the box office. If the patient can afford bridges, he may be told to have his pulpless teeth removed; if he cannot, he may be told to keep such teeth. In any case, no one has described a surefire diagnostic test to apply to the pulpless tooth that appears roentgenologically and clinically free from disease. Some of these people with their pains and aches find improvement following removal of pulpless teeth; others are made definitely worse.

In attempting to evaluate what should be done in each case, once more we are reminded that the human organism is a complex affair and that the evaluation of each patient's condition must be made in terms of his total psychic and somatic makeup.

Lott Day . . .

On May seventeenth the Chicago Dental Society had the distinct pleasure of entertaining the head of the Dental Corps of an allied nation. On that day, Brigadier Frank M. Lott of the Canadian Dental Corps was met at an early hour at the railroad station by a delegation of U. S. Army and Navy officers and a group of civilian dentists. Among the official greeters were Brigadier General Robert H. Mills, Colonels Mathews, Clopper, and Weeks of the Army Dental Corps, and Captains Joseph A. Tartre and Fred F. Molt of the Navy. Following a tour of inspection of the Army dental installations at the Congress and Stevens Hotels in Chicago, the distinguished visitor was escorted to the Great Lakes Naval Training Station. There Brigadier Lott met Rear Admiral John Downes of the Ninth Naval District and the Commandant of the Station, Captain Emmett. Captain Tartre entertained the group at the Of-

ficers' Club where sitting at tables were other distinguished Americans, including Lieutenant Commander Harold Stassen, former governor of Minnesota, and Lieutenant Benny Friedman of All-American football fame.

At the evening session of the Chicago Dental Society Brigadier Lott explained the organization of the Canadian Dental Corps. In his modesty he did not tell that this organization sprang from his own mind and was created through his own efforts. In 1937 Frank Lott, then professor of prosthetics at the University of Toronto, wrote his thesis for a doctor of philosophy degree on the subject of a military dental corps. This thesis was immediately decreed by the Canadian government to be a secret document, and the subsequent organization of the Corps was based on the recommendations contained in this thesis. To the credit of the Canadian government the author of the plan, Doctor Lott, was appointed to activate the plan and became the first commanding officer of the Canadian Dental Corps.

The Canadian Dental Corps is separate from the medical service and is under the direct supervision of the Adjutant-General. Unlike the organization in the U. S. Army and Navy the Dental Corps in Canada is not subordinate to medical officers or to a Medical Corps. The one Dental Corps supplies the dental needs of the Army, Navy, and Air Force in Canada.

Other dental societies in the United States should avail themselves of the opportunity of becoming acquainted with Brigadier Lott who represents the best in the dental profession.

It Has Always Been Thus . . .

Dental officers who are bored with their paper work and the details of Army and Navy administration, who have to make out endless reports, should be cheered by a letter that must certainly reflect their thinking. This letter was written in 1810 by the Duke of Wellington to his Secretary of State for War. One would have to be a pretty tough sort of soldier to knock off Napoleon and only a tough soldier would have written this kind of letter to the Secretary of State for War. Imagine, if you will, in the year 1943, an American general writing a similar letter to the ageing Mr. Stimson or a junior officer writing in this way to his superior! The letter which follows is stamped with the master's hand:

"My Lord: If I attempted to answer the mass of futile correspondence that surrounds me, I should be debarred from all serious business of campaigning.

"I must remind your Lordship—for the last time—that so long as I retain an independent position, I shall see that no officer under my command is debarred, by attending to the futile drivelling of mere quill driving in your Lordship's office—from attending to his first duty—which is, and always has been,

so to train the private men under his command that they may, without question, beat any force opposed to them in the field.

"I am, My Lord,

"Your obedient Servant,

"(Sgd.) Wellington."

We should add that this letter was reproduced in the *Army and Navy Register* of May 22, 1943.—E. J. R.

Sterilizing Needle and Syringe

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Assembled and sterilized needle and syringe with cotton rolls in place.

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(*Continued on page* 278)

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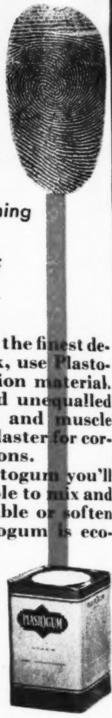

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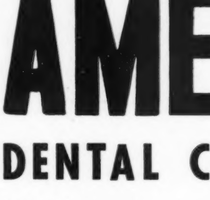

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ringe are used, they are rinsed under running water.

2. The projecting needle is inserted into a cotton roll with the cotton well pulled down over the hub.

3. Another cotton roll is placed in the barrel of the syringe and pushed down with the plunger until it completely covers the part of the needle inside the hub.

4. The complete assembly is now sterilized in boiling water for at least twenty minutes; removed, and put away with the wet cotton rolls in place.

As long as the cotton rolls are in place the needle will remain sterile and may be used at any time without the necessity of being boiled again.

Having a number of complete assemblies of needles of varying lengths and syringes will save considerable time when extraction follows extraction in the course of a busy day.

To be sure, only rustless steel needles should be used, and the assembled and sterilized needle and syringe should be kept in a dust proof compartment, or better, between the folds of a sterile napkin until ready for use.

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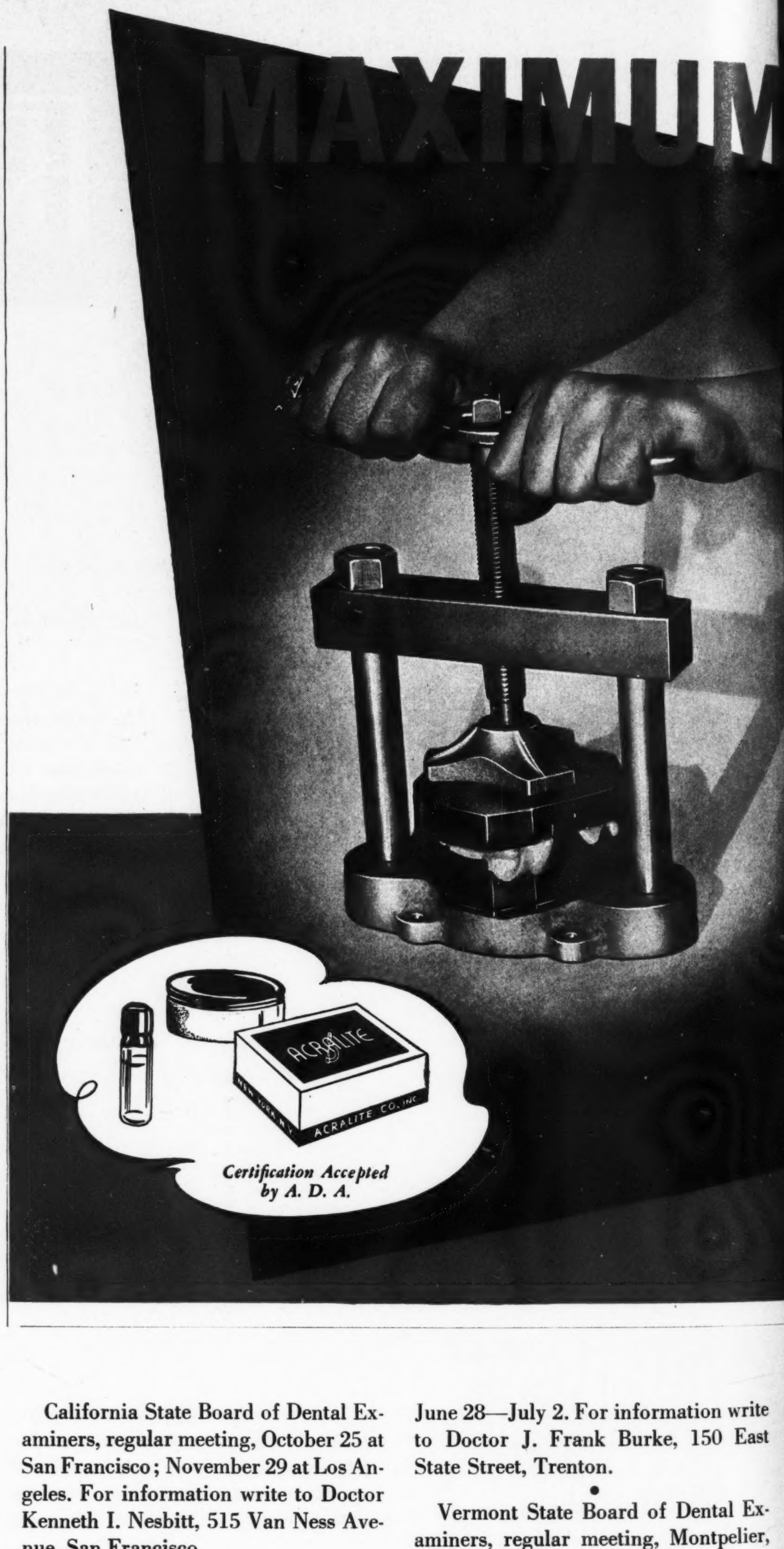

DENTAL MEETING *Dates*

American Society of Oral Surgeons and Exodontists, annual meeting, Cincinnati, Ohio, October 8-9.

Montreal Dental Club, nineteenth annual fall clinic, Mount Royal Hotel, Montreal, October 20-21.

New York Society of Orthodontists, regular meeting, New York City, November 8-9.

Ohio State Dental Society, annual meeting, Cleveland, November 7-10.

Rhode Island Dental Society, annual meeting, Providence, January, 1944.

California State Board of Dental Examiners, regular meeting, October 25 at San Francisco; November 29 at Los Angeles. For information write to Doctor Kenneth I. Nesbitt, 515 Van Ness Avenue, San Francisco.

New Jersey State Board of Dental Examiners, regular meeting, Trenton, June 28—July 2. For information write to Doctor J. Frank Burke, 150 East State Street, Trenton.

Vermont State Board of Dental Examiners, regular meeting, Montpelier, June 28-30. For information write to Doctor C. I. Taggart, 139 Bank Street, Burlington.